Declaration of the candidate

I do hereby declare that the thesis entitled "LAND USE CHANGES AND ITS IMPACT ON INCREASING FLOOD FREQUENCY AND MAGNITUDE IN JALPAIGURI DISTRICT (UNDIVIDED), WEST BENGAL" has been prepared by me under the supervision of Professor Subir Sarkar. This document describes work undertaken as part of Ph.D programme of study at the Department of Geography and Applied Geography, University of North Bengal. All the views and opinions expressed therein remain the sole responsibility of the author, and do not necessarily represent those of the institution. The material embodied in this document being submitted by me to the University of North Bengal is original and has not been published or submitted in parts or full for any other degree of any other institution. The work of other authors or any other organization or agency wherever made use of, in this document have been thoroughly acknowledged.

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This is to certify that Mrs. Kaustabi Maitra has prepared the thesis entitled "LAND USE CHANGES AND ITS IMPACT ON INCREASING FLOOD FREQUENCY AND MAGNITUDE IN JALPAIGURI DISTRICT (UNDIVIDED), WEST BENGAL" for the award of Doctor of Philosophy (Ph.D) degree in Geography and Applied Geography of University of North Bengal under my supervision. She has carried out her research work at the Department of Geography and Applied Geography of University of North Bengal and the thesis has been prepared based on the extensive study of secondary data sources.

It may further be mentioned that Mrs. Kaustabi Maitra has fulfilled all other requirements as per the rules of the University regarding the submission of Ph.D thesis.

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15 Title LAND USE CHANGES AND ITS IMPACT ON INCREASING FLOOD FREQUENCY AND MAGNITUDE IN JALPAIGURI DISTRICT (UNDIVIDED), WEST BENGAL By Kaustabi Maitra
16 CHAPTER – 1 Introduction 1.1 Concept of the present study The Jalpaiguri district has been formed in 1869. It is of comparatively recent creation. Earlier in March 1849, Hooker arrived at 'jeelpigoree'which is the past name of Jalpaiguri. It is

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a large straggling village near the banks of the Tista River. According to Hooker, 'we are detained for several days, waiting for elephants with which to proceed northwards.' (

Subir Sarker, Professor
Department of Geography & Applied Geography
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Kaustabi Maitra
2.05.2023

Preface

Human population and natural ecosystems have remained dependent on river systems from the earliest days of civilizations. Historically, most renowned cities and civilization have developed in close proximity of river systems. These river systems have not only remained as a source of sustenance but also are important parameter in determining the course of landforms. It is believed that even the mighty Himalayas developed from the Tethys Sea. So, changes in landforms and concomitant development of civilizations have remained dependent on river systems from the time immemorial. However, such changes in landforms have not always been positive to human populations where incidences like flood events have remained a recurring destructive event that have led to both human and economic losses like the Hoang Hoo River which has been referred as the "Sorrow of China." So, land use changes brought about by rivers through alteration in their courses can be an important area of research to understand as to how land areas have changed as a consequence of changes of riverine courses and determine how such changes may have affected the human population of that area.

The Jalpaiguri district in sub – Himalayan West Bengal have been inundated by several rivers. Historical documents state that land use changes brought about by these rivers have caused flood incidences that have altered the landforms in this area. Taking a leaf out of the above concept, in the present work we have tried to understand the changes in land use pattern of Jalpaiguri district and estimate the possible factors that may have incurred such changes in this area. Even though some of the changes may be due to natural events like changes of river courses, manmade factors like deforestation, unplanned urbanization and localized industrialization all of which may have played together in altering the land use pattern of this area. In an attempt to document these changes in land use, secondary data derived from satellite imagery has been the cornerstone of the present work.

The main focus of this research work is to understand the influences of human populations on how it is altering the natural land use patterns like grasslands, forests and wetlands and enhancing the manmade land use patterns like tea plantations and settlements. Such alterations in the coming future may adversely affect the frequency and intensity of flood events in Jalpaiguri district.

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2.05.2023

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Words fall short in expressing my gratitude to my parents for their constant encouragement and being there as a backbone for the entire tenure of my doctoral work. Their patience for all my demands cannot be thanked enough on my part. I am also thankful to my brother, sister-in-law and other relatives for their constant encouragement during the tenure of my research. I am also grateful to my husband Dr. Avik Kumar Choudhury for his valuable inputs for executing my work in a well-directed manner. Last but not least, I am grateful to my 5 years old little son, Master Hrishit Kumar Choudhury for being very understanding who kept on waiting for me even when he needed me the most. Such patience from him has been the cornerstone for successful completion of this work.

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Kaustabi Maitra
2.05.2023

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List of abbreviations

HFL: Highest Flood Level

FCB: Flood Control Board

MW: Megawatt

IMD: Indian Meteorological Department

VHF: Very High Frequency

HF: High Frequency

CWC: Central Water Commission

NDMA: National Disaster Management Authority

DL: Danger Level

EDL: Extreme Danger Level

NBFCC: North Bengal Flood Control Commission

NRDMS: Natural Resource Data Base Management System

NDVI: Normalized Difference Vegetation Index

JRC: Joint River Committee